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9/21/98 BUSWK 114

Page 1

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FAILED WIZARDS OF WALL STREET

Can you devise surefire ways to beat the markets? The rocket scientists thought they could. Boy, were they ever wrong

By Peter Coy and Suzanne Woolley, with Leah Nathans Spiro and William Glasgall in New York and bureau reports

Smart people aren't supposed to get into this kind of a mess. With two Nobel prize winners among its partners, Long-Term Capital Management L.P. was considered too clever to get caught in a market downdraft. The Greenwich (Conn.) hedge fund nearly tripled the money of its wealthy investors between its inception in March, 1994, and the end of 1997. Its sophisticated arbitrage strategy was avowedly "market-neutral"--designed to make money whether prices were rising or falling. Indeed, until last spring its net asset value never fell more than 3% in a single month.

Then came the guns of August. Long-Term Capital's rocket science exploded on the launchpad. Its portfolio's value fell 44%, giving it a year-to-date decline of 52%. That's a loss of almost \$2 billion. "August has been very painful for all of us," Chief Executive John W. Meriwether, a legendary bond trader, said in a letter to investors. (Long-Term's executives declined to speak on the record.)

Long-Term Capital and its Nobel laureates in economics, Robert H. Merton and Myron S. Scholes, weren't the only ones who got creamed. Locating the losses is hard because Wall Street and the hedge-fund world don't disclose them. According to Andrew W. Lo, a finance professor at Massachusetts Institute of Technology who advises several so-called quant funds, as much as 20% of hedge funds, which control some \$295 billion, are quantitatively oriented.

LONG-TERM DAMAGE. The losses didn't stop there. Nearly every major investment house and bank in the U.S. and abroad has a group of highly paid rocket scientists in its proprietary trading department trying to beat the market with complex, computer-aided trading strategies. In an announcement on Sept. 2, Salomon Smith Barney Holdings disclosed that it had realized \$300 million in losses from fixed income and global arbitrage--five times its \$60 million in Russia-related credit losses. Then, on Sept. 9, Merrill Lynch & Co. announced that it had lost \$135 million from trading and said that the losses had hurt its own stock price.

August may go down as a watershed in the history of high-tech investing. That's because the losses suffered weren't just financial: The reputation of quantitative investing itself has been dealt long-term damage. Merton and Scholes, after all, are two of the most esteemed figures in finance--co-inventors with the late Fischer Black of the options-pricing model that underpins much of rocket science. They and their counterparts seemed to have developed a clean, rational way to earn high returns with little risk. Instead of betting which way a market is headed, they typically search for ingenious arbitrage plays--chances to cash in on temporary disparities in the prices of related assets.

Wall Street warmed to rocket science not because it was impressed with PhDs in physics or Nobel prize winners in economics. The Street was impressed by the money these quants were making without having to be a George Soros--placing informed bets on the direction of assets like gold, oil, or the British pound. The beauty of rocket science was that though the gambles were huge, the risks were minimal.

In August, though, many of these delicately constructed bets collapsed like a house of cards. Even if the quants do spring back this autumn, it will be impossible for many of them to claim that they can reliably produce low-volatility profits, because the volatility they've experienced this year is anything but low. Suddenly, many market-neutral funds aren't looking any safer than ``directional'' funds run by wizards like Soros.

To be sure, the performance of many quantitative hedge funds doesn't tar all of financial rocket science. Some quantitative firms don't use leverage and seek merely to outperform some benchmark such as the Standard & Poor's 500-stock index. By their own lights, many of those firms came through August fine--sinking, to be sure, but not as much as the benchmarks they measure themselves against. ``Our first objective is to control risk,'' says Stephen A. Ross, a professor at MIT and co-head of Roll & Ross Asset Management Corp., whose return is up for the year and for the month of August against its benchmarks.

``NAUSEATING.'' That's fine for Roll & Ross, but the dark days of August weren't so kind to the quants that take bigger gambles in pursuit of bigger rewards. Turmoil enveloped almost every market. Real estate magnate Samuel Zell says that the market for commercial mortgage-backed securities, in which traders rely heavily on computer modeling, is in ``meltdown.'' Invictus Partners, an eight-month-old arbitrage hedge fund, began June ranked among the top-performing hedge funds in the country, but then lost all of its gains over the summer--and more. ``What began to happen in June, July, and August was hypnotic, nauseating, and awesome,'' says Gregory van Kipnis, the fund's founder and CEO.

One prominent victim was the High Risk Opportunities Fund, a bond-arbitrage hedge fund. It was put into liquidation in the Cayman Islands on Sept. 1. Its \$850 million in Russian investments went bad after Moscow suspended bond and currency trading on Aug. 14. As befits a hedge fund of its type, High Risk Opportunities wasn't betting for or against the Russian economy--it was simply playing the 4% spread between the ruble-denominated Russian Treasury bills, known as GKOs, and the lower cost of borrowing rubles from banks. This seemed a safe bet because it didn't depend on Russia forking over dollars. The fund manager--III Offshore Advisors--was blindsided twice. First, the

Russians halted trading in their domestic government debt market. ``Nobody in the history of the world has ever done anything this foolish,' ' says Warren B. Mosler, the firm's West Palm Beach (Fla.)-based director of economic analysis. Then, several European banks that had sold currency hedges against the plunging ruble abruptly suspended an estimated \$400 million in payments that Mosler contends the hedge fund is owed.

History is what underlies most of the quant models--however, it is not the history of governments, but of markets and prices. Their models are based on identifying historical relationships between the prices of kindred assets, be they bonds, stocks, or currencies. Mountains of data that reflect decades of market behavior are fed into computers. The computer models sift through the data to find the precise relationships between the prices of these assets. Sometimes, the prices move in the same direction. At other times, they diverge. When the assets move out of their normal alignment, the bell rings.

That's a signal to trade on the expectation that prices will revert to historic patterns. The trades can focus on markets throughout the world. It can be two related U.S. stocks, a basket of 15 U.S. biotechnology stocks, two Italian bonds of different maturities, or a basket of foreign currencies. But that's not always where the bet ends. In order to minimize the risk, the computer then spits out what other trades should be made to hedge against any accompanying risks that the arb doesn't want to take on.

Normally, the price discrepancies that the models seek to exploit are tiny--and indeed, have become smaller and smaller as more and more players comb the markets. The result has been bigger and bigger bets. The computer model predicts the exact price points at which to enter the deal and the size of the bet to get the highest returns with an acceptable level of risk. This had led to the use of more and more borrowed money, resulting in many trades leveraged to the hilt. ``Hedge funds with mathematically driven strategies may use far higher than average leverage because of the perceived lower level of risk inherent in their using a large number of diversified positions,' ' says George Van of fund-tracker Van Hedge Fund Advisors International.

Why did rocket science backfire? Sure, the models do take into consideration the possibilities of some failures occurring in the market system that upset normal historical relationships. Indeed, that's why these bets usually involve a series of hedges. What occurred, however, was the financial world's equivalent of a ``perfect storm''--everything went wrong at once. Interest rates moved the wrong way, stocks and bond prices that were supposed to converge diverged, and liquidity dried up in some crucial markets. As Long-Term's Meriwether told his shareholders in a Sept. 3 letter: ``We expected that sooner or later...we as a firm would be tested. I did not anticipate, however, how severe the test would be.' '

At the heart of the breakdown was a global ``flight to quality'' that was far more intense than the wizards' computer models predicted. They had been forecasting that differences in the interest rates of safe securities and risky ones, which had widened, would return to their normal range, as they almost always had before. But as Russia unraveled and parts of Asia fell deeper into crisis, investors around the world switched their money into the safest securities they could find, such as U.S. Treasury bonds.

Many of the quant firms were betting on riskier, less liquid securities such as junk bonds, and they got crushed. Instead of narrowing, the spreads between safe and risky

9/21/98 BUSWK 114

Page 4

securities widened drastically in virtually every market around the world.

The unexpected widening of spreads wreaked havoc on supposedly low-risk portfolios. For example, some quant firms were betting that junk-bond yields in Britain had gotten too high in relation to those of high-grade corporate bonds, and that the spread would narrow. If the yield spread had narrowed, as forecast, the quants would have earned a bundle. But that's not what happened: The yield spreads widened and the quants owed a ton of money.

To work, the quant models need liquid markets on all sides of the trade. But markets in August are thin, as Meriwether noted in his letter to fundholders. Wrote Meriwether: "...volatility and the flight to liquidity were magnified by the time of year when markets were seasonally thin." That's the trouble with liquidity: It's never there when you really need it, as buyers of so-called portfolio insurance discovered in the 1987 stock market crash.

A liquidity drought is basically panic in slow motion. "It wasn't just the big hedge funds," says D. Sykes Wilford, a managing director of New York-based CDC Investment Management Corp. "This summer, it affected lots of people, particularly investment banks, banks, fund managers. They had to reduce their capital exposures. When they do that, other trades that may have looked smart all of a sudden were subjected to this liquidity shock, too, and it fed on itself."

WORLDWIDE PHENOMENON. The stinger is that liquidity dried up across markets. It was a worldwide phenomenon, so the geographic diversification employed by so many quant firms did them not a whit of good. Late August was actually worse for some market-neutral arbitragers than the 1987 crash, admit some quants. "They weren't all bullish and they weren't all bearish, but they were all believers in the liquidity and continuity of markets," says James Grant, editor of Grant's Interest Rate Observer.

The carnage was widespread because so many people were making the same kinds of bets. "When Russia announced default, everybody's risk appetite went down dramatically. Every position held on every dealer's books was subject to liquidation. Any concept of long-term or fundamental value disappeared," says William T. Winters Jr., head of Europe fixed income at J.P. Morgan & Co. in London. "Large investors lost money on positions that became very illiquid and volatile."

Worst hurt of all were highly leveraged hedge funds. Heavy borrowing amplified their returns on the way up, and it amplified their losses on the way down. When spreads widened in a disorganized, tumbling market, gains on short positions weren't enough to offset losses on long ones. Lenders demanded more collateral, forcing the funds either to abandon the arbitrage plays or to raise money for the margin calls by selling other holdings at fire sale prices.

Long-Term Capital responded to the crisis by shedding marginal deals, such as bets on the direction of interest rates, at losses, while keeping in place its core arbitrage bets. As its moniker suggests, the firm is able to hang tough longer than most hedge firms because its capital base is stable. The first date any investors can withdraw capital is the end of 1998, and even then the potential withdrawal is less than 12% of the fund. Borrowing arrangements are long-term as well--generally for six months or a year.

HUBRIS. If markets quickly return to their old alignments, Long-Term Capital will come out way ahead, and August will be nothing but a scary memory. Indeed, the firm is beefing up its bets by raising more capital from investors. But what if the spreads just keep getting wider? It could happen. Grant, the newsletter editor, likes to quote a play-it-safe Wall Street maxim: ``Never meet a margin call.'' In other words, if the market is going against you, concede defeat quickly and liquidate before you really lose your shirt.

Since the quants came to Wall Street, there has been no shortage of critics. Rocket science can't substitute for common sense, says Wilford, who manages a ``market-neutral'' hedge fund himself. ``I've seen too, too many of these quant geniuses that don't have a clue about how markets behave. When they get a shock like this, they're dumbfounded. They just don't have the intuition of what to do.''

The quants may have placed too much faith in their exquisitely tuned computer models. ``The hubris a bad quant can exhibit is, he thinks he has the best model of all time,''' says van Kipnis. ``Many of these models provide the illusion of certainty,''' says economist Henry Kaufman of Kaufman & Kubarych. ``There is a kind of assurance that ultimately can't be satisfied.''

In a certain sense, maybe the problem wasn't too much rocket science, but too little. Extreme, synchronized rises and falls in financial markets occur infrequently--but they do occur. The problem with the models is that they did not assign a high enough chance of occurrence to the scenario in which many things go wrong at the same time--the ``perfect storm'' scenario. Sources say Long-Term Capital's worst-case scenario was only about 60% as bad as the one that actually occurred.

On the other hand, some quant firms made out just fine. Unlike Long-Term Capital, which looked at markets around the world, these firms are niche players, and their models concentrate on specific markets. Roll & Ross, for example, employs a value approach to stocks, using the latest academic research to screen for a combination of low price-earnings and market-to-book-value ratios.

Another example of wizardry that worked is a little-known niche firm based in Radnor, Pa., owned by Banque Nationale de Paris, called BNP/Cooper Neff Inc. The only bet BNP/Cooper Neff makes is arbitrage between stocks that become overvalued or undervalued because of such things as money flows in and out of markets. It is scrupulously neutral on the attractiveness of growth stocks vs. cyclical stocks, or large-capitalization stocks vs. small-cap stocks.

Although the firm's assets under management aren't huge--about \$10 billion--it estimates that it accounts for about 4% of the daily trading volume on the New York Stock Exchange and 6% to 10% of the volume on the principal exchanges of France, Germany, Spain, and Italy. BNP/Cooper Neff--which is so far not open to outside investors--needs enormous volumes of trades because its average profit margin per trade is so small. Their research staff includes about a dozen physics PhDs. While it won't release its results, Chairman and co-founder Richard W. Cooper says: ``August was the best month in our history. In markets that become irrational, you can find greater mispricing opportunities.''

But Cooper's firm is not typical. And, after its summer setback, rocket science,

9/21/98 BUSWK 114

Page 6

whether quants bounce back or not, will be forced to change. It will have to adjust its models to account for more riskiness in global markets. The search for inefficiencies in markets that can produce profits will continue. But there's one thing to remember about being on the cutting edge: Sometimes, you bleed.

Why the Computer Models Misfired

LACK OF LIQUIDITY

When a computer program pinpoints a profitable hedge, the assumption is that there will be a buyer on the other side of the transaction when the deal is settled. But the turmoil in Russia and Asia so unsettled the markets that buyers disappeared.

BREAKDOWN OF PATTERNS

Usually, traders can hedge their bets by investing in many different geographical regions. But in recent weeks, the patterns have become synchronized, so that a decline in one region would no longer be offset by a rise in another.

LIMITED APPLICATION

Models that may be useful for countries with well-developed markets don't work well in smaller markets.

MISSING STREET SMARTS

Many mathematical geniuses with little practical experience in the markets have been hired on Wall Street. ``Black box'' models put on autopilot, without review or input by seasoned traders, can fail.

POLITICAL RISK

The models failed to assess realistically the risk that Russia would backslide so abruptly on the road to capitalism.

Photograph: NEW TACK? Nobel laureates and Long-Term Capital Management partners Scholes (left) and Merton couldn't stanch the firm's losses in August

PHOTOGRAPHS BY JOHN MABANGLO/SIPA PRESS; BROOKS DRAFT/SYGMA

Photograph: MERIWETHER FEATURED ON THE COVER OF BUSINESS WEEK'S AUG. 29, 1994, ISSUE

Photograph: ARB HORROR: Invictus' founder called the summer's losses ``hypnotic, nauseating, and awesome''

Illustration: Chart: ONE WAY THE QUANTS GOT CREAMED

CHART BY ERIC HOFFMANN/BW

9/21/98 BUSWK 114

Page 7

----- INDEX REFERENCES -----

COMPANY: MASSACHUSETTS INSTITUTE OF TECHNOLOGY

NEWS SUBJECT: (U.S. Residential Mortgage-Backed Securities (1US15); Forecasts (1FO11); Corporate Funding (1XO17); Securitization (1SE75); Banking Risk (1BA09); Funding Instruments (1FU41); Investment Banking (1IN86))

INDUSTRY: (Mortgage Banking (1MO85); Investment Management (1IN34); Banking (1BA20); Bank Operations (1BA31); Trends in Technology (1TR23); Financial Services (1FI37); Securities Investment (1SE57); Science (1SC89); Science & Engineering (1SC33); Bonds (1BO97))

REGION: (North America (1NO39); Western Europe (1WE41); Europe (1EU83); New York (1NE72); Americas (1AM92); Asia (1AS61); USA (1US73); Florida (1FL79); France (1FR23))

Language: EN

OTHER INDEXING: (BANQUE NATIONALE; CDC INVESTMENT MANAGEMENT CORP; CHART; COMPUTER MODELS MISFIRED; COOPER NEFF; COOPER NEFF INC; FEATURED; GEORGE SOROS; GRANT; HIGH RISK OPPORTUNITIES; HIGH RISK OPPORTUNITIES FUND; HUBRIS; KAUFMAN KUBARYCH; LYNCH CO; MASSACHUSETTS INSTITUTE OF TECHNOLOGY; MERRILL; MISSING; MIT; MORGAN CO; NAUSEATING; NEW YORK STOCK EXCHANGE; NOBEL; PHOTOGRAPHS; QUANTS; ROLL ROSS; ROLL ROSS ASSET MANAGEMENT CORP; RUSSIAN TREASURY; RUSSIANS; SALOMON SMITH BARNEY HLDGS; SOROS; STANDARD POOR; TACK; US TREASURY; VAN HEDGE FUND ADVISORS INTL) (Andrew W. Lo; Boy; Cooper; D. Sykes Wilford; ERIC HOFFMANN; Extreme; FAILED; George Van; Grant; Gregory; Invictus; Invictus Partners; James Grant; JOHN MABANGLO; John W. Meriwether; Lenders; Meriwether; Merton; Mosler; Myron S. Scholes; Richard W. Cooper; Robert H. Merton; Roll Ross; Samuel Zell; Scholes; Stephen A. Ross; Street; Wall Street; Warren B. Mosler; Wilford; William T. Winters Jr.; Wrote Meriwether) (Cover Story)

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9/21/98 BUSWK 114
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